

Reproduction in the King Cobra, *Ophiophagus hannah* Cantor

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(Plates I-V)

INTRODUCTION

THE King Cobra (*Ophiophagus hannah* Cantor), the longest venomous snake in the world and one of the very few occasionally aggressive species, is one of a small number of snakes that guards the eggs during incubation, and is the only snake known to deposit its eggs in a nest made of vegetable matter. A good deal has been written about each of these attributes, but little is known of the details of the reproductive habits of the species.

That a snake constructs a sizeable nest of vegetable material is difficult to imagine. Colonel Frank Wall summarized the knowledge about this snake up to 1924 and concluded, "It seems most probable she selects a chance accumulation of debris which she can appropriate for her use." Wall also pointed out that little is known of the courtship, period of gestation or period of incubation in this species. He did report the killing of two pairs in the act of mating, one in March and the other in late April or early May, but gave no additional details. Little additional information on these topics has been published since the date of Wall's paper.

Wasey (1892) appears to be the first to report the deposition of eggs in a nest and the guarding of eggs. He killed a snake 9 feet 8 inches long on "a heap of dried leaves," at the bottom of which he found 33 eggs. Fenton (1917) reported finding an individual, also of unspecified sex, 9 feet 3 inches long, on a mound of leaves 2 feet high and 8 or 9 feet in circumference. He failed to note any eggs. H. C. Smith (1936) described a nest in detail and included a photograph of the nest, eggs and the dead snake, which was not sexed but measured 7 feet 5 inches. The nest contained 27 eggs and was a compact mass of dead leaves measuring 1 foot 7 inches in diameter and 9 inches deep. The eggs were covered

with a layer of leaves that formed the bottom of the upper depression of the nest on which the snake was resting when discovered. Mustill (1936) described a nest observed by him in 1926. This contained 40 eggs and was guarded by a snake that measured "about 12 feet in length." The nest "was built in the base of a small shrub about 6 inches from the ground and at first sight it resembled the nest of an English magpie. It was composed of sticks and other debris and contained a hole in the top through which the snake could pass." Mustill estimated the nest to be 2 feet from top to bottom and about 2 feet 6 inches in diameter. He noted an upper and lower chamber, with the eggs in the latter and the snake resting in the former.

King Cobras in the collection of the New York Zoological Park have provided data on the reproductive habits of this interesting species. Three specimens were obtained from a dealer in Bangkok, Thailand, and reached the Park on October 10, 1953. At that time the larger male measured 14 feet 6 inches, the smaller male 11 feet 2 inches and the female 13 feet 4 inches. The snakes were kept in temporary quarters until April of 1954 when they were moved to their permanent home in the newly renovated Reptile House. Here the three snakes were placed in a cage 7½ feet long, 6½ feet wide and 6½ feet high. The cage is provided with a large water pool approximately three feet long and two feet wide. In one corner of the cage there is a raised planted area, containing small bamboo stalks with leaves. Several vertical sticks of bamboo are set in the floor of the cage for decorative purposes and are on the opposite side. A shift cage 6 feet long and 2 feet wide adjoins the main cage but is not visible to the public. The door to this cage is usually left open, permitting the snakes free access except when

it is desired to isolate one or more for feeding or some other reason. The shift cage provides the snakes with an area of seclusion from the public, although rarely do all three retire to the shift cage at the same time.

The floor is heated by hot water pipes located in the floor across the front of the cage. This provides a thermal gradient from the front to the back of the cage. The average temperature is between 27° C. and 30° C., with the front area being two or three degrees warmer than the rear. The floor is covered with white crystalline sand, from a half to an inch in depth. In the right rear corner there is a small pile of bamboo leaves and stalks. This is a favorite resting place of the three snakes and is the spot in which the nest has been built each year. The cage is lighted with incandescent lights, but also is provided with ultraviolet light that is turned on for daily intervals of 15 to 30 minutes.

The King Cobras are fed an average of once a week on dead snakes that have been frozen and thawed. Many species of snakes have been used as food in this manner, including boids, colubrids, viperids and crotalids. Once the cobras were accustomed to this type of food, they refused live snakes and would eat them only after they had been killed.

In 1955 and 1956 the smaller male and the female mated and the female laid eggs. Observations were made on these activities each year and both still photographs and motion pictures were obtained. I am grateful to Sam Dunton, Staff Photographer at the New York Zoological Park, for his cooperation and patience in getting an excellent photographic record. Head Keeper Stephen Spencook and Keepers Peter Brazaitis, Raymond Cummins and Robert Raabe all assisted greatly in recording the data reported herein and have my sincere thanks.

COURTSHIP AND MATING

Early in March of 1955 the larger male and the female were observed in intermittent courtship activity, but no record was made of the duration or exact nature of the activities and no mating was observed. On March 10, 1955, I observed the smaller male and the female in courtship. When first noted at 12:30 p.m. the female was crawling slowly around the cage. Her head and neck were raised obliquely about ten inches above the floor and her hood was spread (Fig. 1). The male was on top of the female with his head about three feet behind hers. He was moving forward along her back with his tongue flicking out frequently. When his head reached the hood of the female, he gently nudged her hood and head several times with his nose (Fig. 2). The male constantly

licked his tongue on either side of the female's head (Fig. 3). During the entire process both snakes crawled slowly around the cage,

The rear half of the male's body looped back and forth on either side of the female's body and slowly moved backward and forward as the two crawled along. The male occasionally slid off the female, at which time his head explored along her sides, nudging her. She paused several times and as soon as she started crawling again the male regained his position on top of her, usually about mid-body. His head quickly moved forward along her back, nudging her body with his snout as he moved along her back and continually flicking his tongue on her skin.

The female appeared to stimulate the male by merely crawling slowly away from him. When the female stopped crawling or if she attempted to coil, the male nudged her body sharply with his snout (Fig. 4). Either individual seemed able to initiate courtship. At the beginning, the male appeared to be stimulated visually and throughout courtship by chemical stimuli perceived through the tongue-Jacobson's organ system and possibly some tactile stimulation. In contrast the female appeared to respond primarily to tactile stimulation alone. Sex recognition probably involves visual and chemical cues, as well as behavior. Whenever the smaller male was actively prowling about the cage and touched the larger male, the latter reared, spread his hood and made threatening jabs that seemed to divert him. When the smaller male came upon the female, she would lie still until he pushed her vigorously with his head, or sometimes immediately start to crawl away, whereupon he would attempt to court her.

After the pair had courted for about thirteen minutes and shortly after a series of gentle nudges by the male, he lifted the rear of her body with his tail, brought his vent under hers (Fig. 5) and both hemipenes were everted about an inch but quickly withdrawn. Courtship was resumed and after another three minutes the male again raised the base of the female's tail. At this time his vent was approximately opposite and under hers but on the right side. His left hemipenis only was everted and copulation was effected. Immediately all movement stopped and the pair remained motionless for the next 15 minutes. Slowly the male moved off of the female so that the two were headed in opposite directions. The male tried to pull away, but the female began to crawl slowly, taking the male with her (Fig. 6). The two remained in contact for 57 minutes, after which time they separated, each going to opposite sides of the cage.

The temperature in the cage at the time of this mating was 27.5° C. (82° F.). The day was

clear and mild with an outdoor temperature of 21° C. (69° F.). A crowd of fifteen to twenty persons gathered in front of the cage from time to time but the snakes appeared completely undisturbed.

On two other occasions in 1955 this same pair was observed in a mating union when the keepers entered the Reptile House in the morning; once at 7:21 a.m. on March 14 and again at 7:23 a.m. on March 18. On neither of these days was the complete time of mating recorded, since the snakes were already in contact when noted. On the 14th the snakes separated at 8:07 a.m. and on the 18th at 7:31 a.m.

In 1956 the smaller King Cobra engaged in courtship with the female for several minutes on January 6, but no mating occurred. Courtship again occurred on January 12. On January 16 vigorous courtship took place for 22 minutes and culminated in mating.

On January 17 the same pair commenced courting at 9:40 a.m., during which time the male made three efforts to insert the hemipenes into the female. At 10:00 a.m. a successful union was made. As in the previous matings, all movement stopped as soon as one of the hemipenes was inserted. On this occasion copulation lasted 58 minutes, during the latter half of which time the female crawled around slowly, pulling the male with her. Fifty minutes after the union was effected and while the two snakes were still in copulation, the male was in the vicinity of the water pool and took a long drink. Throughout this courtship and mating the cage was brightly illuminated by photoflood lights, which appeared to have no effect on the snakes.

On January 26, the smaller male and female were observed in copulation at 8:31 a.m. They parted at 9:37 a.m. During the night of February 17 this pair shed their skins. About 3:00 p.m. on February 18, the two males participated in a brief and incomplete "combat dance." Each reared the anterior portion of its body and entwined it with that of the other while making short jabs with its head at its opponent's head. They separated after a minute or two and the larger male attempted to court the female, but was driven away by the smaller male. The latter courted the female and mating took place at 3:24 p.m. This union was broken at 4:23 p.m. After being driven away by the smaller male, the larger male remained quietly in a corner of the cage, apparently indifferent to the mating pair.

On March 8 and 14 the smaller male and female were observed mating, between 8:20 a.m. and 9:00 a.m. on the former occasion and between 8:05 and 8:55 a.m. on the latter. The start of neither of these matings was noted.

Courtship and mating in all of the observed instances followed the pattern reported in detail for March 10, 1955.

NEST BUILDING

The building of the nest was observed and photographed both years. In anticipation of this activity, freshly cut bamboo stalks were laid around the floor of the cage, and each year after the female began to build her nest, additional bamboo and some large dead magnolia leaves were introduced into the cage away from the side of the nest.

On April 21, 1955, at 7:40 a.m. the female was observed pushing the bamboo litter of the floor into a compact pile near the center of the cage. This was done by crawling part way around a pile of litter and then drawing the head and body back in an open loop. Between 8:00 a.m. and 9:00 a.m. she moved this pile into the rear corner of the cage behind several vertical sticks of bamboo. She soon had virtually all of the bamboo stalks back in the corner and began pushing sand on the pile. This was done by tilting the head about 45° to one side and pushing it through the sand for a short distance, then dragging the loosened sand back on the inside of an open loop. Moving the bamboo litter and the sand were both accomplished by movements that resulted in the anterior one-third to one-half of the body being employed as a large hook used on its side to drag in the loose material.

At 9:20 a.m. additional stalks of bamboo were spread around the floor of the cage and the two males were removed. (They were not returned to the cage until after the eggs had been removed on May 4, 1955). Neither had made any movement until just prior to this time, when the smaller male tried to crawl onto the growing heap of bamboo stalks. The female drove him away with two quick and forceful jabs of her head. This appears to be the customary method of avoiding intrusion or rejecting advances. I have seen these snakes use this movement many times when excited. The mouth is kept closed and the snake strikes out sharply with the head. It is a more forceful movement than the gentle jabs of courtship.

After driving away the male, the female rested on top of her pile of bamboo, lying in an elongated coil that covered the entire pile. She remained in this position with little movement until 3:30 p.m. when she began moving more bamboo toward the nest pile. At this time several clumps of dried magnolia leaves were put on the floor, but she ignored them. She coiled up on top of the pile again at 4:10 p.m. and remained quiescent the rest of the day.

Keeper Raabe came in early on the morning

of April 22. Before he turned on the lights at 7:16 a.m. the female was resting quietly on top of the pile of bamboo. As soon as the lights were turned on, she moved off the pile and started dragging in a clump of magnolia leaves. These were drawn to the top of the pile on the inside of a loop of her body held close against the floor of the cage. At 7:24 a.m. she crawled into the pile and began pushing out a chamber from the inside. She crawled round and round in a tight coil inside of the nest, sometimes pausing to push out a loop of her body to pack down the bamboo and leaves. Once she pushed the loop out with her head. After several minutes of this she emerged from the nest part way and, using her head to loosen the sand, drew some sand in on the pile of leaves.

Without resting, she crawled farther out into the cage, entwined her body through several bamboo stalks that were together and pulled them back in a loop of her body (Fig. 7). Then she went out and drew her body around a pile of magnolia leaves, which she dragged back with the forward part of her body (Fig. 8). She retired again to the center of the nest and, coiling tightly, revolved around in the middle of the structure, pausing occasionally to thrust the leaves and stalks back with a loop of her body. These movements became quite jerky and she appeared to be exerting considerable force to form the inner chamber of the nest. It became increasingly difficult to observe her movements since the nest had become quite large and most of her body was not visible when she retired into it. In entering and leaving the nest pile the female followed no regular path. One time she would enter from the side and go under or into the accumulated material. The next time she might go on top of it. She never entered from the front, but always from one side or the other. When the nest was nearly completed she appeared to go to the top of the pile rather than in the sides.

At 7:44 a.m. she again emerged from the nest, crawled out and around a pile of leaves she had previously moved into the corner of the cage. With her body looped tightly around this bunch of leaves she literally carried them to the pile, holding the coil about two inches off the ground. These were pulled inside the nest and she again revolved several times in a tight coil. Some leaves dropped out of her coil as she tried to pull them inside. She soon emerged and continued dragging in stalks and leaves. At 8:50 a.m. additional bamboo and magnolia leaves were placed around the floor of the cage. At this time the snake was spending longer and longer periods of time shaping the interior chamber and was almost entirely hidden from view. Occasionally

she would come out and drag in small amounts of additional material.

At 10:00 a.m. the female emerged from the nest and crawled to the water pool where she took a long drink. She rested awhile beside the pool and then retired into the nest. Little movement of any sort was noted until shortly after 1:00 p.m. when she again began revolving inside the nest, making jerky pushes outward with a loop of her body. These movements lasted less than 15 minutes, after which time she remained quietly in the nest. No activity of any sort was observed on the 23rd of April, and the eggs were laid on the morning of the 24th. After the eggs were all laid in the central chamber, the female moved leaves over them and almost completely covered them with a layer of litter (Fig. 9). She then coiled on top of the leaf-covered egg heap. This is probably the basis for the statements of H. C. Smith and Mustill that the nest is divided into an upper and a lower chamber, with the eggs deposited in the latter and the snake resting in the former.

In 1956 the female started building her nest on the morning of April 20, almost exactly one year from the date she started her nest in 1955. The method of dragging in leaves and stalks was the same as that employed the previous year. The female worked on and off all day the first day and most of the second. During both days the cage was lighted by photoflood lights to permit the taking of motion pictures. The following morning the female tore the nest apart in some unobserved fashion, scattering many of the leaves and stalks all around the cage. She commenced to rebuild it shortly after 8:40 a.m. and completed the job on the afternoon of April 23. In the rebuilt nest the inner chamber was located about one foot away from where it had been situated in the two previous nests, and was shallower. The eggs were laid on the morning of April 24, the same date as in 1955. This time, possibly because of the shallower chamber, the female did not cover the eggs completely and coiled her body partly around the uppermost eggs.

Eggs

It is impossible to determine the period of development of the eggs since there is no way of knowing accurately when they were fertilized. In 1955 three matings were observed, all in March within a period of nine days. Whether or not there were other matings is unknown. In this year the eggs were laid approximately six weeks after the first recorded mating and about five weeks after the last. In 1956 the pair was observed mating on six occasions over a period of approximately sixty days. The last two mat-

ings, on March 8 and 14, fall within the period of the three observed the previous year and would give a developmental period of five to six weeks.

In their studies on reproduction in the Garter Snake (*Thamnophis sirtalis*), Frank N. and Freida Cobb Blanchard (1941) found that very early matings were not followed by correspondingly early births. Late April seemed to be the invariable start of the period of development. This, they inferred, was related to the arrival of more or less continuously warm weather. Such would not appear to be the case with snakes kept indoors at more or less constant temperatures all year. It is unwise to speculate on the basis of data from only two years, but it is interesting to contemplate whether the deposition of eggs on the same date each year is coincidental or the result of some regulatory factor.

In 1955 part or all of the egg clutch had been laid by 7:45 a.m. when Head Keeper Spencook checked the nest. Eggs were visible in the center of the nest at that time. The female continued to move around in the center of the nest, but we were unable to determine definitely whether she was continuing to lay eggs or simply covering them. Around 10:00 a.m. she became quiet, resting near the top of the central chamber with only part of her body visible. No eggs could be seen at this time. At 1:00 p.m. the leaves covering the chamber of the nest were gently lifted away so that photographs could be taken. As soon as we tried to uncover the eggs the female quickly covered them again with leaves or her body. She usually brought her head around quickly to wherever the leaves were removed and would push other leaves over the exposed eggs.

In order to photograph the eggs in the nest and to count and measure them, the female was removed from the nest and restrained behind a large plastic shield. After counting, 14 of the eggs were replaced and the shield was withdrawn. She immediately returned to the nest, covered the eggs and resumed her resting position in the upper part of the nest.

In 1956 all of the eggs had been laid by 8:00 a.m. when the nest was checked. Again most of the eggs were taken out of the nest, but five were returned. The female again covered these eggs and coiled on top of them.

The number of eggs previously reported in the literature varies from 21 to 40. In 1955, the female laid a total of 41 eggs, of which 11 were abortive. The abortive eggs were one-half to two-thirds the size of the normal ones and were covered with a more pliable shell. In 1956 a single small abortive egg was found on the floor of the cage each morning on April 17, 19 and

21. Sometime during the early morning of April 24 an additional 48 eggs were laid in the nest, making a total of 51. An exact count was not made of the abortive eggs in this clutch, but approximately forty appeared to be of that nature and soon spoiled. The remaining eggs became moldy and were destroyed.

Ten of the normal-appearing eggs of the 1955 clutch were weighed and measured the afternoon on which they were laid. The data obtained were as follows:

APRIL 24, 1955			
Egg No.	Weight (in grams)	Length (in mm.)	Width (in mm.)
1	40.0	60.0	34.0
2	40.0	57.7	34.3
3	40.5	58.1	35.0
4	40.0	57.6	34.6
5	42.5	58.5	32.8
6	41.0	58.8	35.0
7	40.5	59.2	34.8
8	42.8	64.3	34.6
9	40.9	63.2	32.3
10	40.3	58.1	36.0

The eggs removed from the nest were divided into three lots: one for incubation in leaf litter, one for incubation in damp sawdust and one for incubation on moist paper towels. The ten eggs that were weighed and measured were placed in damp sawdust. These were weighed and measured on three subsequent occasions, as follows:

MAY 23, 1955			
Egg No.	Weight (in grams)	Length (in mm.)	Width (in mm.)
1	51.0	61.5	38.1
2	50.5	61.2	38.9
3	46.5	64.7	35.1
4	50.0	59.3	39.5
5	47.5	62.8	36.2
6	51.0	61.1	38.6
7	51.5	62.6	36.3
8	54.5	61.9	40.1
9	57.0	60.4	41.6
10	57.2	62.1	41.5

JUNE 14, 1955			
Egg No.	Weight (in grams)	Length (in mm.)	Width (in mm.)
1	56.5	61.2	41.2
2	55.3	60.8	40.0
3	50.5	64.9	36.1
4	53.0	58.7	41.0
5	50.7	61.8	38.8
6	56.2	61.2	41.0
7	54.5	63.3	38.1
8	59.5	61.5	41.7
9	73.3	63.7	46.8
10	74.0	65.4	46.5

JULY 5, 1955			
Egg No.	Weight (in grams)	Length (in mm.)	Width (in mm.)
1	58.0	61.5	41.3
2	62.0	61.5	43.8
3	52.0	65.0	36.7
4	57.0	59.4	40.8
5	58.0	64.6	41.1
6	82.0	65.8	48.0
7	75.0	66.8	44.1
8	71.0	63.7	44.5
9	hatched	—	—
10	96.0	70.8	49.5

At 4:00 p.m. on July 4, egg No. 9 had a slit in the shell and the hatchling had its head and about 1 inch of the body protruding through the slit. The snake emerged sometime during the night. It measured approximately 460 mm. in total length and weighed 23 grams. During the following nine days thirteen other youngsters emerged, but four of these were crippled by deformities of the spinal column. Thus a total of nine healthy-looking youngsters were obtained from the clutch.

The period of incubation before the first egg hatched was ten weeks and one day, and the total period until the hatching of the last egg was eleven weeks and three days. During incubation the ten measured eggs increased an average of 66.1% in weight, 8.1% in length and 26.2% in width.

No data are available on the weights, measurements or incubation period of the eggs in the 1956 clutch.

GUARDING THE NEST

Early reports on the discovery of nests of King Cobras invariably include a guarding parent. Although the sex was not determined in any of the reports I have seen, Wall (1924) says, "All those who have met the hamadryad during the period of incubation have remarked upon the fact that the female has been coiled up on a nest of leaves, or vegetable rubbish." It appears to have been a common assumption that the guardian snake was the female, but whether this is invariably so or not I do not know.

In 1955 after the female had been moved off of her nest so that we could examine the eggs, she returned to it the afternoon of April 24 and remained coiled on the eggs until 4:40 p.m. on April 28 when she left and went to the water pool to take a long drink. The remaining eggs were removed from the nest on May 4 because they were becoming covered with mold. The female remained on the nest for a day or two longer, but the two males were returned to the cage and the nest was soon matted down into a common resting site for all three snakes. The

female left the nest on May 4 to take her first meal since building it.

On April 25, 26 and 27, while the female remained on the nest, temperature readings were taken of the cage floor immediately beneath the nest, the interior of the egg cluster, between the coils of the snake, and the air one foot above the nest. These readings were taken with a Schultheis thermometer graduated in .2° C. There was not more than .4° C. difference in any of the readings, which were 27.4° to 27.8° C., and no constant pattern was noted in the differences. From these observations it is concluded that the presence of the female in the nest causes no rise in temperature that would aid the incubation process. Rather, her role in remaining with the eggs appears to be solely one of protection.

Many of the reports of unprovoked attacks by this snake attribute particular aggressiveness to the female when guarding her nest. Thus Wall (*op. cit.*) says, "The female when disturbed in the process of brooding her eggs, seems to be specially sensitive, and usually attacks the intruder at sight." This may be an exaggeration. There is no doubt that these snakes are sometimes aggressive, but whether this is the exception or the rule is open to question. G. H. Evans (1921) reports an encounter with a large King Cobra that was intent on escaping and made no effort to attack despite considerable provocation. He concluded with the remark, "I am more than ever convinced that hamadryads as a rule are as glad to escape as most other snakes." H. C. Smith (1936), referring specifically to a guardian snake on a nest close to a forest path, wrote, "It is interesting to note that fourteen people accompanied by seven dogs twice passed at different times within two yards of the nest and yet the hamadryad failed to show itself and the nest remained undiscovered until I prodded the heap of leaves with a small cane."

The three snakes whose activities are reported here were quite aggressive when they came to the Zoological Park, but, like most snakes under proper conditions of captivity, they became accustomed to the presence of visitors and keepers. By 1955, when the first matings occurred, none of the three seemed to pay attention to the keepers cleaning their cage except to investigate movements or cleaning implements. The snakes would not spread their hoods unless aroused vigorously. So far as we could tell, there was no change in disposition on the part of any of the snakes during the period of courtship and mating nor on the part of the female while guarding her nest, although the males were somewhat more alert to movements and were more active during this time. When the female was disturbed on her nest she appeared more concerned with

covering her eggs than with trying to drive off the intruder. Even when she was removed from the nest forceably to enable us to take out the eggs, she made no effort to strike or bite.

YOUNG

The nine healthy young snakes, six males and three females, were marked very differently from the adults (Figs. 11 & 12), as had been noted by Wall (*op. cit.*). The ground color was black. This was interrupted by a series of narrow white to yellowish-green cross-bands approximately one scale wide and separated by spaces three to four scales wide. The scales bordering the light bands were mostly solid black, whereas those inside the dark interspaces were light in the center. The snout was white to yellow, with a narrow black band across the sutures of the internasals and prefrontals, extending ventrad onto the labials. There was a broader supraocular black band followed posteriorly by a narrow yellow area. The first of the black interspaces was on the rear of the head and neck.

The young varied from approximately 460 to 640 mm. in total length and in weight from 19 to 26 grams. They quickly assumed a defensive attitude when disturbed and struck vigorously if approached too closely (Fig. 12). They refused all food offered them and lived only four or five months. The food offered them included earthworms, mealworms (*Tenebrio*), Red-backed Salamanders (*Plethodon cinereus*), Red Efts (*Diemictylus v. viridescens*), American Toads (*Bufo terrestris americanus*), Spring Peepers (*Acris gryllus crepitans*), Carpenter Frogs (*Rana virgatipes*), Northern Fence Lizards (*Sceloporus undulatus hyacinthinus*), Green Anolis (*Anolis c. carolinensis*), Little Brown Skinks (*Lygosoma laterale*), Florida Green Water Snakes (*Natrix cyclopion florida*), Northern Water Snakes (*Natrix s. sipedon*), Striped Keelbacks (*Natrix stolata*), DeKay's Snakes (*Storeria d. dekayi*), Red-bellied Snakes (*Storeria o. occipitamaculata*), Eastern Garter Snakes (*Thamnophis s. sirtalis*), Eastern Ground Snakes (*Haldea v. valeriae*), Eastern Ring-necked Snakes (*Diadophis punctatus edwardsi*), Eastern Worm Snakes (*Carpophis a. amoenus*), Black Racers (*Coluber c. constrictor*), Eastern Smooth Green Snakes (*Ophedrys v. vernalis*), Eastern Milk Snakes (*Lampropeltis dolia triangularum*), Florida Crowned Snakes (*Tantilla coronata wagneri*), Northern Copperheads (*Ancistrodon contortrix mokeson*), baby House Mice (*Mus musculus*), baby white mice and strips of horse meat.

All of these items were offered in an unaltered condition, and many of them were also rubbed

with live and dead Asiatic snakes and lizards of several species not recorded. Several of the young were force-fed with some of the above-listed food animals and with a prepared liquid food mixture.

SUMMARY

Two King Cobras (*Ophiophagus hannah* Cantor) from near Bangkok, Thailand, have mated during two successive years in the New York Zoological Park. Observations are reported on their courtship and mating. Three matings were recorded in 1955 and six in 1956. Five to six weeks after the last mating in each year the female constructed a large nest of bamboo stalks, bamboo leaves and magnolia leaves. On April 24 of each year she deposited her eggs, 41 the first year and 51 the second. A high percentage of each clutch consisted of abortive eggs. The female remained on the nest guarding the eggs until all had been removed. Young hatched ten to eleven weeks after the eggs were laid, but refused all food offered and lived only four to five months.

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EXPLANATION OF THE PLATES

(Note that in the photographs the neck of the female is sometimes inflated in an abnormal fashion. This is apparently a recurrent condition in this specimen). All photographs by Staff Photographer Sam Dunton.

PLATE I

- FIG. 1. The courting pair crawl slowly around the cage, with the male on top of the female. The water pool and planting area are at extreme left; the shift cage door is visible on the right.
- FIG. 2. The heads and the anterior bodies of the courting pair. (Enlarged from a 16 mm. motion picture film).
- FIG. 3. The male frequently flicks his tongue on the head of the female. (Enlarged from a 16 mm. motion picture film).

PLATE II

- FIG. 4. The male (upper) prods the female (lower) at the start of courtship. They are on a pile of bamboo leaves in a corner of the cage. Note vertical bamboo sticks. (Enlarged from a 16 mm. motion picture film).
- FIG. 5. The posterior parts of the bodies showing how the male (right) places his tail under the female's tail at the moment the hemipenis is inserted. (Enlarged from a 16 mm. motion picture film).

PLATE III

- FIG. 6. The female (foreground) and the male (rear left) in copulation, approximately thirty minutes after the beginning of the mating. This picture shows almost the entire cage in which the snakes were kept. The water pool is in the left foreground and the main door to the cage in the left background.
- FIG. 7. The female looping her body around some bamboo leaves and sticks preparatory to pulling them into the nest pile at the beginning of nest building. The site of the nest is behind the vertical sticks of bamboo in the right background.

PLATE IV

- FIG. 8. The female beginning to draw in a clump of magnolia leaves. Seen from above with nest site at right rear behind vertical bamboo sticks.
- FIG. 9. The female coiled on her eggs at the conclusion of laying, April 24, 1955.
- FIG. 10. The exposed egg cluster deposited on April 24, 1956. These were in second nest built in 1956 and forward from site of previous nest.

PLATE V

- FIG. 11. Five eggs and two hatchling King Cobras.
- FIG. 12. A hatchling King Cobra spreading its hood in a defensive posture before fully emerged from the egg.